

WHAT IS CLAIMED IS:

1 1. A composition comprising a liquid crystal dispersed within a polymer
2 matrix, the polymer matrix formed by the cross-linking of a polyacrylate resin and a
3 polyisocyanate resin, the liquid crystal exhibiting a minimum bulk resistivity of 1×10^{12}
4 ohm.cm and a voltage holding ratio (VHR) of 98% or greater.

1 2. The composition of claim 1 wherein the ratio of liquid crystal to
2 polymer is between about 50/50 and 70/30 (wt/wt).

1 3. The composition of claim 1 exhibiting a driving voltage of 280 V or
2 less across an air gap of at least 15 μm .

1 4. The composition of claim 1 exhibiting a sensitivity of between about
2 15 to 40 ADU/V at an air gap of at least 15 μm .

1 5. The composition of claim 1 wherein the polyacrylate resin contains
2 hydroxyl groups which can be used for cross-linking.

1 6. The composition of claim 1 wherein the liquid crystal is selected from
2 the TL series available from EM Industries.

1 7. A method of detecting defective operation of an electro-optical device,
2 the method comprising:

3 disposing a polymer dispersed liquid crystal (PDLC) overlying and separated
4 from an underlying electro-optical device by an air gap, the PDLC having a polymer matrix
5 formed by the cross-linking of a polyacrylate resin and a polyisocyanate resin, and having a
6 liquid crystal exhibiting a minimum bulk resistivity of 1×10^{12} ohm.cm and a voltage holding
7 ratio (VHR) of 98% or greater;

8 applying a voltage to a transparent electrode overlying the PDLC while
9 illuminating the PDLC; and

10 detecting a changed intensity of light transmitted by the PDLC.

1 8. The method of claim 7 wherein the PDLC is disposed over a glass
2 substrate bearing a thin film transistor.

1 9. The method of claim 7 wherein the changed intensity of light is
2 detected by reflection of the incident light by a mirror.

1 10. The method of claim 7 wherein the PDLC comprises a ratio of liquid
2 crystal to polymer of between about 50/50 and 70/30 (wt/wt).

1 11. The method of claim 7 wherein the applied voltage is between about
2 100-320 V across an air gap of at least 5 μm .

1 12. The method of claim 7 wherein the PDLC exhibits a sensitivity of
2 between about 15-40 ADU/V.

1 13. The method of claim 7 wherein the polyacrylate resin is selected from
2 the group consisting of Paraloid AU1033 available from Rohm and Haas, and Doresco TA45-
3 8 or Doresco TA65-1 available from Dock Resins.

1 14. The method of claim 7 wherein the polyisocyanate resin comprises an
2 aliphatic polyisocyanate such as Desmodur N-75 from Bayer Polymers.

1 15. The method of claim 7 wherein the liquid crystal is selected from the
2 TL series available from EM Industries.

1 16. An apparatus for inspecting a semiconductor device, the apparatus
2 comprising:

3 a support for a semiconductor device;

4 an electro-optic modulator separated from the support by an air gap, the
5 electro-optic modulator comprising,

6 a mirror disposed proximate to the support,

7 a transparent electrode distal from the support, and

8 a polymer dispersed liquid crystal (PDLC) sensor material disposed
9 between the transparent electrode and the mirror, the PDLC having a polymer
10 matrix formed by the cross-linking of a polyacrylate resin and a
11 polyisocyanate resin, and a liquid crystal exhibiting a minimum bulk
12 resistivity of 1×10^{12} ohm.cm and a voltage holding ratio (VHR) of 98% or
13 greater;

14 a light source configured to illuminate the PDLC material during application
15 of a voltage to the transparent electrode; and
16 a detector configured to detect intensity of light reflected by the mirror.

1 17. The apparatus of claim 16 wherein the support comprises a support for
2 a workpiece bearing a thin film transistor.

1 18. The apparatus of claim 16 wherein the air gap has a width of between
2 about 5-30 μm , and a voltage of about 100-320 V is configured to be applied to the
3 transparent electrode.

1 19. The apparatus of claim 16 wherein the PDLC exhibits a sensitivity of
2 about 15-40 ADU/V.

1 20. The apparatus of claim 16 wherein the liquid crystal is selected from
2 the TL series available from EM Industries.